DOCUMENT RESUME

ED 209 992 HE 014 555

AUTHOR Dodds, Agnes E.; Lawrence, Jeanette A.
TITLE Heuristics for Planning University Study at a Distance.
PUB DATE 81
NOTE 23p.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Adult Students; *College Students; Course Objectives; Course Organization; Extension Education; *External Degree Programs; Foreign Countries; Higher Education; Instructional Materials; Models; *Student Educational Objectives; Student Evaluation; Study Guides; Study Habits
IDENTIFIERS *Australia

ABSTRACT

A model to describe how adults work on university courses at a distance from campus was developed at an Australian university. The model was designed to describe how students define the task/goal and plan their study, based on G. Ploya's (1957) Heuristic and A. Newell's and H. A. Simon's (1972) General Problem Solver. Verbal reports were obtained from four female students enrolled in an advanced educational psychology course as external students. Each student gave a clear account of her aims for studying the course. Goals were expressed in terms of: credit and assessment requirements, information in the course materials, both new information and that which was a followup to information from previous courses, interest, and application for both practical and vocational purposes. When students opened course materials, the interviewer asked the student to think out loud while she examined the study guide, course materials booklet, and other written information and directions. Two of the students expressed their goals more in terms of credit and assessment requirements, while the other two students were concerned with the interest level of the course. While the students differed in their primary goals, each showed a strong tendency to organize the course materials around assignments. It was found that students' aims were different from those of the course coordinator. It is suggested that the study demonstrates the possibility of describing distance students' patterns of study. The heuristic for studying a new course involved: defining the task/goal, devising a plan, carrying out the plan, checking, and achieving the task/goal. A bibliography is appended. (SW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED209992

Heuristics for Planning University Study at a Distance

Agnes E. Dodds and Jeanette A. Lawrence

Murdoch University, W.A. 1981

Running Head : Distance Students' Heuristics

Requests for reprints should be directed to the External Studies Unit. Murdoch University, W.A. 6150.

An earlier version of this study was reported at the ASPESA Forum, Perth, 1979.

HE 014 555

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Agnes E. Dodds

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Abstract

A model to describe distance students' perceptions of their aims and plans for studying a course was developed following Polya's Heuristic and Newell & Simon's General Problem Solver.

Verbal reports from four students were described using the model. It was shown the students' aims were different from those of the course coordinator, and influenced how they planned and organized their study. Implications of the formalization of the model for understanding student behaviour and course design are discussed.

Introduction

The aim of this study was to devise a way of describing how adults work on university courses at a distance from campus. Campus educators have been assisted in the design of curricula by information about the processes by which students tackle course work (Hill, 1960; Hunt, 1970). It seems that designers of external university courses have made certain assumptions about how external university courses materials are studied, that is, that students will read required and additional materials, and that they will seek assistance when they are presented with information beyond their understanding. Information is usually presented in printed or audible form, and requires individual processing by the student who works at a distance from campus without the benefit of frequent face-to-face tuition. However, there is almost no discussion of the processes of studying externally in journals on adult education. Enrolment, withdrawal and success statistics of external university students are available but no information about what students do when their course materials have arrived. Consequently any suggestions of strategies for developing the requisite skills for studying via written and audio materials at a distance is without baseline data.

While we know of no data directly describing how external students work, there is a wave of process research in cognitive psychology describing how individuals work on problems, what personal in-put and strategies they use, and how they put it all together to produce a solution. Descriptive models have been developed to analyse the components of various problem solving operations, and how such components of various problem solving operations are combined to give solutions to problems. (Newell and Simon, 1972; Larkin, 1979).

The assumption made is that how a person tackles the task is as important as if they reach the desired solution. The desired solution may be a correct answer, as in well-defined problems which have correct goals, for example, (1) games: chess, logic, toy problems (DeGroot, 1965; Chase & Simon, 1973; Simon, 1975); (2) medical diagnostic work-ups (Elstein, Shulman & Sprafka, 1978; Mandernach, 1978); (3) Piagetian and other cognitive developmental problems (Klahr & Wallace, 1970; Pitt, 1976). Alternatively, subjects may be shown to generate their own individual solutions to questions which have no correct solutions, that is problems involving moral (Lawrence, 1979), and personal and professional choices such as choosing a home (Svenson & Montgomery, 1974) or business procedures (Clarkson, 1962). The description of problem-solving operations for well-structured and value-laden problems requires the development of a set of categories by which subjects' behaviours can be described.

Polya (1957) developed a comprehensive heuristic or rule of thumb of definable steps for instructing students to solve novel mathematics problems. Newell & Simon's General Problem Solver has been used to show how people move from an Initial Problem State to the Goal-State or solution of a problem. It conceives of each problem-solving operation as the progressive reduction of the distance between the problem and its solution. Pitt(1976) has successfully combined Polya's notions of defining the initial problem, and planning a solution with Newell & Simon's concept of sub-goaling. She developed a comprehensive model to describe the different processes by which chemistry professors, undergraduates and fifteen year olds solved Piagetian chemistry problems. It was our aim to follow Pitt's pattern

and to describe the ways in which distance students defined and planned their work on an external university course. The combined Polya and Newell & Simon approaches provided a model for describing student behaviours. The "Thinking aloud" technique used by problem-solving researchers, and a clinical interview technique were judged as suitable sources of data of students' thoughts about their studies. (Lawrence, 1981; Svenson, Lawrence & Willis, 1981).

Harré & Secord (1973) have suggested that the researcher ask people what they do and think. This approach is congruent with treating subjects as full human beings with powers of language communication and self-monitoring of behaviour. We endorsed the Harré and Secord approach and considered that students' self-perceptions and reports of their personal systems of study would provide important evidence of how distance students usually work. There would be no more direct sources of such data (Lawrence, 1981).

Corroborative data could be gathered by using (1) different forms and phases of questioning, for example, verbal interview and written self-monitoring reports, and (2) evidence obtained from subject's verbalization of their initial responses to the packet of course materials. The latter technique is an adaptation of the "Thinking aloud" data which has yielded rich data of problem-solving operations (Ericsson & Simon, 1980).

An initial heuristic was designed to described how a student defines the task/goal, and plans his or her study. Life-styles and contingencies identified previously in external studies literature can be decribed as helps and hindrances at various stages in the process. (Willen, 1977; Dahlöff, 1977; Dodds, Lawrence & Guiton, 1981). Building on the Harré & Secord assumptions, and as an initial study, it was decided to collect in-depth data from a few subjects, and to use

the heuristic to describe each subject's responses to a set of questions about study patterns. It was expected that initial definitions of the steps in the process would provide a set of empirical descriptors of the types of aims, plans and activities that comprise an adult distance student's study of new course materials. The heuristic is described in Figure 1. A subject's study patterns are described in terms of: (a) defining of the task and its goal, (b) planning strategies, (c) executing plans, (d) checking, and (e) achieving the goal.

FIGURE 1 ABOUT HERE

Method

Subjects

Students were four females enrolled in a course of advanced educational psychology as external students at an Australian University. All four lived in the metropolitan area. They ranged in age from 22 to 30 years. All four had completed initial tertiary teacher education programs and were either enrolled in B.Ed. programs, or in a teaching certificate conversion course.

Materials

Materials were comprised of two of five sources of information. A structured interview administered to subjects prior to the start of the course was designed to be followed up with self-monitoring report which would be filled in by each subject during the third week of the course. The interview was designed to gain open-ended responses to questions about a subject's study goals and plans for the current course, and retrospective data about studying strategies used in relation to a course undertaken in the previous semester. Built into the interview was a section in which the student opened the external

course materials package, under the "thinking aloud" condition. The self-monitoring report asked the subject to document the work done in the first three weeks of semester.

Procedure

Two phases of data-collection were used. In Phase I each student was interviewed at home or in a university room by the same experimenter. Interviews were audiotaped and transcribed for analysis. In Phase II, each student received a Self-Monitoring Report Form to complete and return early in semester. S1 withdrew from the course without completing the form, but was retained in the sample for information about factors leading to her withdrawal and for her perceptions about the course materials. S2 returned the form on time, S3 was ill and returned it 4 days late, S4 returned the form 4 days late, because she was moving house. Transcripts of the interviews and self-monitor reports were coded by two experimenters independently for evidence of students' goals and planning strategies. Coding consensus was obtained by discussion.

Results

The students' responses are reported as their expressed goals for their course work and their planning strategies for studying. Students' goals and plans are compared with the aims of the course coordinator.

(1) Students' Expressed Goals

Each student gave a clear account of her aims for studying the course. Goals for the course were expressed in terms of: (a) credit and assessment requirements; (b) information in the course materials; both new information and that which was a follow-up to information from previous courses; (c) interest; (d) application for both practical and vocational purposes.

Table 1 documents the students expressed goals, with indication of the expressed primary goals of each student.

TABLE 1 ABOUT HERE

S1 was concerned with meeting the formal requirements of the course. S2 had similar goals but was most concerned with obtaining information. She expected that the course might also "be to my advantage as a teacher". S3's goals were identified as information and application with a dominant concern with material that interested her. S4 expressed the dual goals of interest, and relevance and applicability for her teaching work and personal development. She was aiming to follow-up her earlier courses in educational psychology especially in relation to her work, "plenty of practical application for using examples like that in my classroom". The identification of goals and major emphases in the data showed that the subjects had multiple purposes for the course. Once identified, goals could be examined for their relationship to student's plans and for their influence on early work on the course.

(2) Planning Strategies

The interview questions elicited information about the way students planned their work, (a) in general, and (b) in relation to the written materials. Two general questions were asked, with probes, "How do you go about planning the work?" "Do you make conscious decisions?" When students opened course materials, the experimenter asked the student to think out loud while she examined the study guide, course materials booklet and other written information and directions. Each student's perceived planning strategies are presented in Table 1. Assignment and assessment orientation predominated for Ss 1 & 2. Responses from

Ss 3 & 4 showed the strong influence of personal interests in how they planned to read the materials and to select and organize their assignment work. Further evidence of planning strategies was found in the discussions of various of the written materials. The expectations of Ss 1, 2 and 3, were that the Course Materials Book would provide them with direction for their study through topic outlines, summaries and reprints. S4 who was motivated by interest and applicability said she would use the course materials for finding practical and relevant information. Similarly she wanted personally relevant information from the textbook. The other students claimed to centre textbook readings around the assignments. Students' plans for working on the course materials are most informative when juxtaposed with expressed goals, as in Table 1.

(3) The Relationship Between Defined Goals and Planning Strategies

S1 and S2 who were credit- and information-oriented both said that they would plan the semester's work around the assignment topics and the due date. Their responses to the materials indicated that they would structure their reading around chosen assignments. S3 usually chose her assignment topics before beginning the course. S2 also planned to check her responses against the Course Coordinator's stated objectives. In a previous course this student had thought she was doing well until she had performed unsatisfactorily in an examination. She interpreted that experience as a misunderstanding of the Course Coordinator's emphases, and she was determined not to have this happen again. S3 and S4 both expressed the importance of retaining their interest levels as a motivating and structuring factor. Both these students like S1 and S2 said they would make logistical plans focussed on the dates for submitting assignments. However they both made the qualification

"I probably wouldn't stick to them". S3 and S4 were at least one week late in submitting their first assignment. S3 said she would select and read topics and papers for their interest value. The rest will be summarized and "skimmed". For S4 any failure of the materials to interest her or to be applicable to her life and work would result in her "sending it back". Selectivity prevailed in her intentions.

Thus the analysis of the interview data showed a strong tendency for planning strategies to follow from, and be structured by expressed goals. Organization, selection and reading plans were developed in the service of known goals. This trend was shown in unprobed initial examination of the course booklets, as well as in response to questions about planning.

The thinking aloud condition provided supportive evidence of the centrality of assignments. Each of the four women gave spontaneous attention to the Study Guide. They zeroed in on those sections stating assessment procedures and dates for submission of work. In contrast only one student even glanced at the cover letter which lists contents of the package and formal procedures for the semester. That letter was perceived as a form letter and of no interest.

In summary the data showed similarities and differences in students' initial approaches to the course. Two students expressed their goals more in terms of credit and assessment requirements. Two students were concerned with the interest level of the course. While the three students differed in their primary goals each showed a strong tendency to organize her attack on the course materials around the assignments. Even the interest and application dominated students went directly to the assignments. They emphasized that they would *choose* topics to work on, according to their own interests and individual motivations.

They had dual purposes: getting the course done and serving their own expressed needs for interesting and relevant material. One of these women reported in the self-monitoring report that her work so far involved a quick overview of the whole course and the early isolation of areas on which she intended to concentrate (S3, ie in 3 weeks).

Assignments and assessment procedures were central focuses around which these students built their planning strategies even when aims other than credit dominated their motivation. It is necessary to ask whether the stress on these aspects of the work - a stress which advisors on distance education emphasize when planning courses with academics in particular disciplines - is not being interpreted by students in quite a different way to that perceived by the course coordinator. Assignments become either hurdles towards meeting credit requirements, and other parts of the course fade into insignificance; or they become choice-points for selecting topics to work on, with the same consequences. Each of our students was bent on using selection strategies. Yet the course had been designed as an integrated body of new information.

(4) Comparison With Course Coordinator's Definition and Structuring of the Task

As the course was an advanced undergraduate course and the third in a sequence it was designed around specific objectives of the student's development of an advanced body of psychological knowledge and the acquiring of a set of research skills. The course coordinator's objectives were made explicit in the study guide. The course had been designed to provide a "hands on" experience of critique and construction of research. The course coordinator's heuristic is shown in Figure 2.

FIGURE 2 ABOUT HERE 12

S1 and S4 listed course coordinator's objectives in their criteria for a good study guide. S2 said that she would use course coordinator's objectives to make sure she was meeting requirements when writing assignments. S4 showed a combination of individualistic "interest" and a desire to know "what is expected of me".

The students intended to use the materials to serve their own ends. The course coordinator had designed and packaged them to provide a different learning experience. The application of the heuristic to these data, and to the course coordinator's objectives revealed the collision of two sets of aims for the same set of materials. Our descriptions provided information useful for the course designer and not otherwise available.

Formalization of the Heuristic and Conclusions

Examination of the Defining the Task/Goal and Planning features of the data, and their relation to each other provided a means for formalizing a general heuristic to describe distance students' studying behaviour. There are four variations, dependent on the designation of the Defining of the Goal by a given student. The general descriptive model was derived from a modification of the Polya heuristic combined with a General Problem Solving Behaviour Graph. It describes the student's behaviour as the movement from the initial state to the goal-state in terms of the General Problem Solver. We have described the initial state as Definition of Task/Goal, following Polya's heuristic. The Goal-state is the student's achievement of the stated goal. Movement from one to the other is through a series of sub-goals which we have defined as: Planning, Carrying out the Plan, and Checking. Helps and hindrances can be accounted for by the heuristic at each sub-goal and intervening space, eg our S4 had to delay working on the course

because she moved house. S2 had to organize time to get to a library by using a child-care centre two mornings a week. The problem space between the initial and goal-states covers the semester's work. Details of the model remain to be completed from the collection of further data. At this stage the formalization of the heuristic is dependent primarily on the subject's definition of the task, and on his/her structuring of the course's work in relation to that definition. Any generalization of the final form of the heuristic requires replication. Our purpose here was to develop the first approximation of a descriptive model. At this stage in the study four variations on the general heuristic can be discussed.

1. Definition of the Task/Goal - Credit and Assessment Requirements.

The Goal State becomes passing the Course, gaining credit. A student for whom this is the dominant goal can be expected to structure his/her work on the course around the assignments and other forms of assessment. These are the logical, identifiable means to the defined end. Other features of the course may serve lesser goals but meeting assignment and assessment requirements are the only way to achieve the primary goal.

Our S1, for whom Credit Requirements was the dominant goal, expressed her planning behaviour in terms of assignments and due dates. Her withdrawal from the course was not incongruent with her stated aims, since she only needed three credits to complete her programme. Dropping the course did not prevent her from meeting that goal. She had enrolled for two courses and could afford to drop one. The effect of subsidiary goals on her choice will need to be followed up at a later interview.

2. Definition of the Task/Goal - Interest.

The Goal State becomes Personal Interest Satisfied. It can be expected that a student who expresses interest as a primary aim will reduce the space between Definition and Goal by a series of sub-gaols based on a selection from the array of materials and topics provided in the structured course materials. Should the total body of information interest the student or capture his/her imagination then more study will result. However, help and hindrance factors may be related either to other interests, such as our S3's life-style, or to other subsidiary goals, such as gaining credits and placating the course coordinator.

3. Definition of the Task/Goal - Vocational and Practical Application.

The Goal State becomes Materials for Application to personal and work needs. Where this orientation dominates, it can be expected that a subject will u selection sub-goals. Those parts of the course materials will be studied which can be applied to concerns of the classroom and other pressing concerns. Practicalities will be extracted from the "impractical" and "theoretical gunk". Our S4 expressed her strategies as "I'll look through the Course Materials to see what I can use in the classroom".

4. Definition of Task/Goal - Information (new and follow-up).

The Goal State becomes Information obtained. In this variation two possible sub-goaling routes can be anticipated: A student may select from the array of materials and topics. This is dependent on a student's satisfaction with a degree of information other than the integrated body of knowledge involved in the course coordinator's aim. The variation allows for individualized learning goals. Again selectivity prevails. Alternatively a student may wish to integrate the total array of materials and topics - as the course coordinator hopes. If this sub-

goaling route is followed a student will be expected to follow the structure of the course as set out by the course coordinator.

Multiple Goals can be described. Concurrent primary goals, and primary and secondary goals may be in evidence. For example, S4 expressed two primary goals - personal interest and vocational application. These were not discordant - both plans could be expressed by selection from materials on the student's own criteria. Presumably most students will be aiming for passing grades along with other goals, like interest. The general descriptive model, with these initial variations, allows for possible modifications of aims and goals as the semester's work progresses. It is conceivable that the student will be engaged by the content area. In the campus situation he/she can be captured by the erudition and wit of the lecturer. This is perhaps more difficult at a distance, but not impossible. Our S1 had taken one previous course because she appreciated the course coordinator's approach. The heuristic provides a means for comparing course coordinator's and student's objectives. The course designer may set out objectives and design a nice path along the halls of learning for the distance student. However, like Pilgrim, in Pilgrim's Progress, the student may take By-Pass Meadow, with sights on a different goal. The formalization of both sets of aims and pathways make the possible divergences explicit. It is important that course coordinators make their own objectives clear. It may be equally important for them to be aware that their carefully constructed learning experience can be short-cut. If the whole package is vital, then some built-in checks may be desired. The strong assignment and assessment orientation shown in our data can be

used to structure materials for either selection or integration. The general usefulness of the study lies in its demonstration that it is possible to describe distance student's patterns of study. Description of study behaviour provides useful information for experts in distance education. Following a description of what students do, educators can decide either to modify their offerings to suit existing heuristics, or to intervene to develop new study patterns in their distance students' work.

REFERENCES

CHASE, W.G., and SIMON, H.A. Perception in chess. Cognitive Psychology, 1973, 4, 55-81.

CLARKSON, G.P.E. Portfolio Selection: A Simulation of Trust Investment. Englewood Cliffs, N.J.: Prentice-Hall, 1962.

DAHLÖFF, V. Reforming Higher Education and External Studies in Sweden and Australia. Stockholm: Almquoit and Wiksell, 1977.

de GROOT, A.D. Thought and Choice in Chess. The Hague: Mouton, 1965.

DODDS, A.I., LAWRENCE, J.A., and GUITON, P. Distance university students' perceptions of the influences on their study. Paper presented at the biennial forum of the Australia and South Pacific External Studies Association, Fiji, Suva, September, 1981.

ELSTEIN, A.S., SHULMAN, L.S. AND SPRAFKA, S.A. Medical Problem-solving: An Analysis of Clinical Reasoning. Cambridge, Mass.: Harvard University Press, 1978.

ERICSSON, K.A. and SIMON, H.A. Verbal reports as data. Psychological Review, 1980, 87(3), 215-251.

HARRÉ, H. and SECORD, P.F. The Explanation of Social Behaviour. Totowa, N.J.: Littlefield, Adams & Coy, 1973.

HILL, R.J. A Comparative Study of Lecture and Discussion Methods. New York. Fund for Adult Education, 1960.

HUNT, D.E. A conceptual level matching model for co-ordinating learner characteristics with educational approaches. Interchange, 1, 1970.

KLAHR, D. and WALLACE, J.G. An information processing analysis of some Piagetian experimental tasks. Cognitive Psychology. 1970, 1, 358-387.

LARKIN, J.A. Processing information for effective problem solving. Engineering Education. December 1979, 285-288.

LAWRENCE, J.A. The components of moral judgement-making: doctoral dissertation, university of Minnesota. Dissertations Abstracts International. 1979, 40(2), 896-B.

LAWRENCE, J.A. A Case for the Usefulness and Plausibility of Thinking-aloud Verbal Data. Paper to be presented at the Annual Conference of the Australian Association for Research in Education. November 1981.

MANDERNACH, J.B. The Use of Reasoning Procedures in Medical Problem-solving. Unpublished doctoral dissertation, University of Minnesota, 1979.

NEWELL, A. and SIMON, H.A. Human Problem-Solving. New York: Prentice-Hall, 1972.

PITT, R.B. Toward a comprehensive model of problem-solving: Application to solutions of chemistry problems by high school and college students. (Doctoral dissertation, University of California, San Diego, 1976). Dissertation Abstracts International. 1977, 37, 4730B, (University Microfilms No. 77-4218, 145).

POLYA, G. How to Solve It: A New Aspect of Mathematical Method. (2nd ed.). Princeton: Princeton University Press, 1957.

SIMON, H.A. Functional equivalents of problem-solving skills. Cognitive Psychology. 1975, 7, 268-288.

SVENDON, I.F., LAWRENCE, J.A. and WILLIS, S.G. Distance University Students' Use of Course Material to Complete Mathematics Exercises. Paper presented at biennial Forum of the Australia and South Pacific External Studies Association. Fiji, Suva: September 1981.

SVENSON, O. and MONTGOMERY, S. A note on thinking aloud protocols obtained during the choice of a home. Reports from Psychological Laboratory. University of Stockholm, 1974, No. 421.

WILLÉN, B. Doctoral Dissertation in Preparation. Upsalla University, Sweden, 1977.

Table 1 : Definition of Goals and Planning Strategies For An External Course Expressed by Four Women Distance Students

	Student			
	STUDENT 1	STUDENT 2	STUDENT 3	STUDENT 4
GOALS:	Credit and Assessment, Information	Credit and Assessment, Information* Application	Information Interest* Application	Information Interest* Application*
PLANNING STRATEGIES:				
(a) General Plans:	plans around assignment due dates	Decides on end-product and logistics, chooses assignments early and plans reading around assignments	concentrates on what interests and skims rest, orders assignments early to fit life-style	interest directs, organizes assignment dates, works in bursts via interest
(b) Plans specific to materials:	used in relation to assignments	reads for assignments and assessment and for course coordinator's emphases	organizes and reads materials, summarizes and selects topics by interest	selects readings and assignments for interest relevance & vocational/practical application

Key: * primary goals for student

Figure 1

HEURISTIC FOR STUDYING A NEW COURSE

VIA EXTERNAL MATERIALS

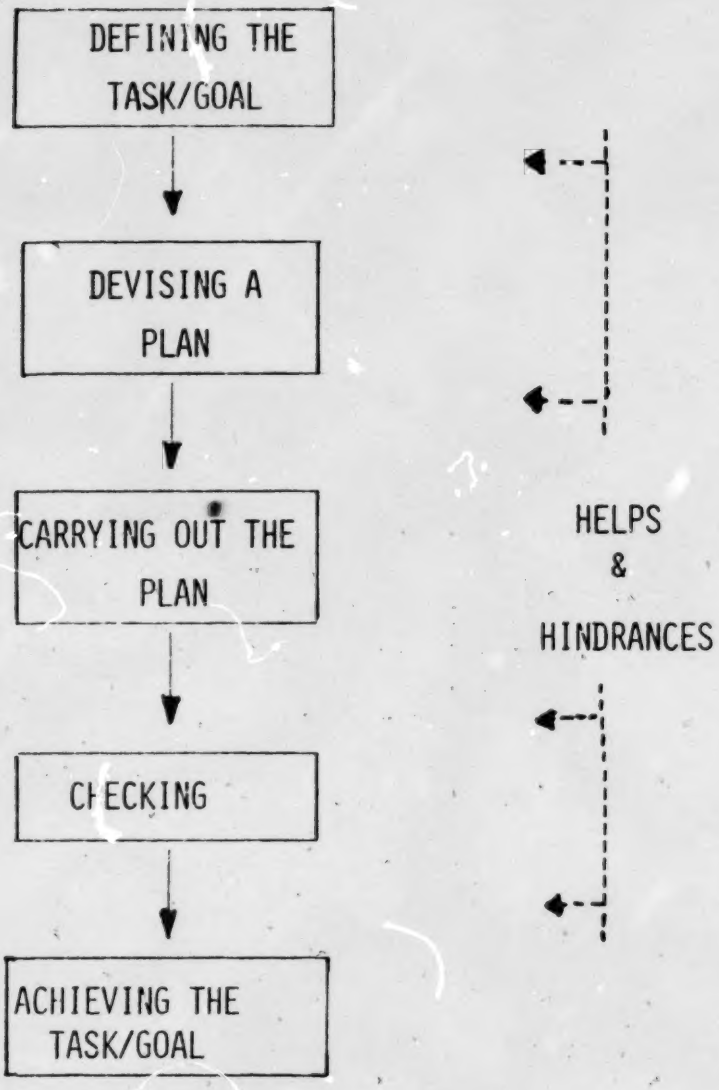
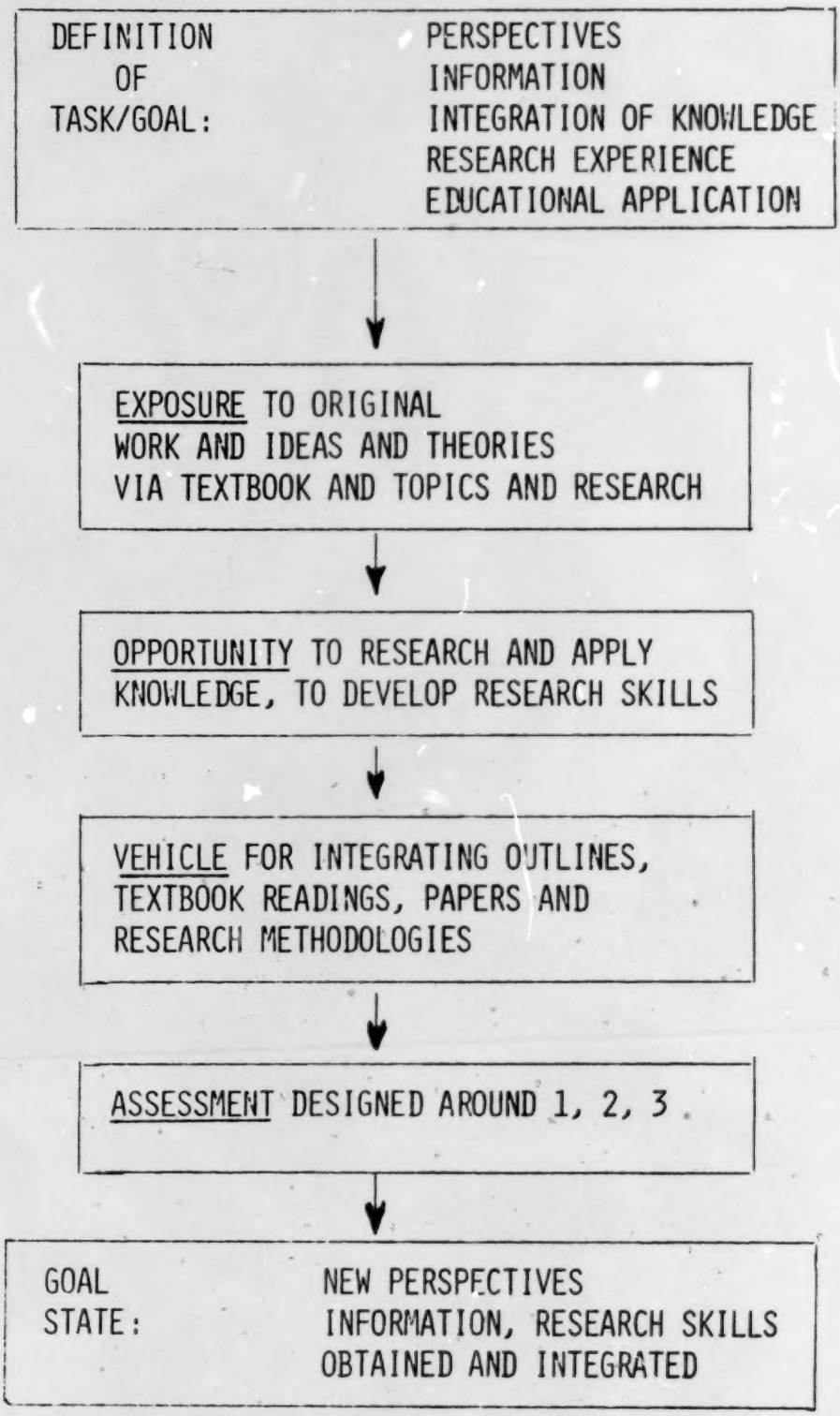


FIGURE 2

COURSE COORDINATOR'S HEURISTIC


DEFINITION OF TASK/GOAL:
PERSPECTIVES
INFORMATION
INTEGRATION OF KNOWLEDGE
RESEARCH EXPERIENCE
EDUCATIONAL APPLICATION
EXPOSURE TO ORIGINAL WORK AND IDEAS AND THEORIES VIA TEXTBOOK AND TOPICS AND RESEARCH
OPPORTUNITY TO RESEARCH AND APPLY KNOWLEDGE, TO DEVELOP RESEARCH SKILLS
VEHICLE FOR INTEGRATING OUTLINES, TEXTBOOK READINGS, PAPERS AND RESEARCH METHODOLOGIES
ASSESSMENT DESIGNED AROUND 1, 2, 3
GOAL STATE:
NEW PERSPECTIVES
INFORMATION, RESEARCH SKILLS
OBTAINED AND INTEGRATED